

REMARKS

Claims 17-24, 31-33, and 38-49 are active in this application. Reconsideration is respectfully requested.

New Matter Rejection

The new matter issue raised with respect to the amendment made to page 46, line 6 is believed obviated by the restoration of the ratio of the volume of pores having diameters exceeding 200 Å to 3 %.

As to the matter of the amendment to the continuation of Table 1 on page 49, the amendment made to the Table is not new matter because the correct value of 20 % is also shown at page 46, line 10 of the specification. A correct copy of the table is again provided. Withdrawal of the objection is respectfully requested.

Request For Reconsideration

Claims 17-24, 31, 38, 42 and 43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 06-216,446 in view of JP 4-175,277. This ground of rejection is respectfully traversed.

Applicants do not concur with the Examiner's stated view (page 4, lines 8-12 Of the final Action) that the (only) difference between applicants' claimed method of producing porous carbonaceous material in Claim 38 (and also Claim 44) and the disclosure of '446 is the curing of resin in step (1) of the present claims. As applicants have stated previously, the '446 publication shows primary activation of the carbonaceous material being conducted *following* subsequent to carbonization, followed by grinding of the cured product into a powder. On the other hand, in the present process embodiments the resin employed in the process is cured

and the cured material obtained is then pulverized, followed by carbonization. Thus, pulverization in the present process occurs before carbonization which means that in the carbonized product the formation of mesopores tends to be uniform. On the other hand, when a cured product is carbonized without pulverization as in '446, hard charcoal in block form tends to be obtained, and the following pulverization tends to be troublesome and lengthy. As stated previously, the significance of this basic difference in the two processes is that when a material is subjected to carbonization, desorption of volatile components during the operation occurs which results in the formation of mesopores. Accordingly, if a cured product in the form of a block is carbonized such as taught by '446, mesopores are formed in a non-uniform manner.

Applicants submit that the cited '277 publication does not bring the prior art closer to the present invention because the method of the reference, although disclosing the use of a liquid phenolic resin as a material to produce activated carbon, wherein the resin contains some volatile components which are the same as found in the resin of the present invention and the viscosity of the resin of the reference partially overlaps the viscosity range of the present claims, nevertheless, an evaporation type foaming agent is mixed in with the resin for treatment to thereby actively form macropores in the product having pore diameters in excess of 200 Å. Consequently, the pore size distribution of the product of '277 is totally different from that of the present invention.

In the context of this discussion it is helpful to show the importance of the viscosity range (0.1 to 100 Pa·s) of the present claims in obtaining the product of the present invention. Note that the viscosities of the resins of Comp. Examples 1 and 2 of the present text are 0.08 Pa·s and 120 Pa·s respectively. Thus, when such resins are used to prepare electrode material

for electric double layer capacitors, capacitor performance tends to deteriorate in comparison to the capacitors of the present invention.

As to the importance of the boiling point limitation for the resin of the present process ranging from 120 to 400° C, note that as shown in Comp Examples 3 and 4 of the text where resins are used which have boiling points outside the range of the present claims, when the resulting carbonaceous materials are used to prepare electrodes for an electric double layer capacitor, the performances of the capacitors tend to be poor in comparison to capacitors of the present invention.

The Examiner contends that one of skill in the art would view as obvious the modification of the process of forming an active carbon electrode material of '446 by using the glycerols or oxyalkylene compounds of the '277 reference in the process disclosed in '446 and thereby arrive at the present invention. Applicants contend, on the other hand, that the disclosures of the two references do not permit such a combination. It must be borne in mind that the '446 reference fails to disclose whether the phenolic resin is liquid or solid. Further, the amount and viscosity of the volatile component are also unclear. Moreover, the cured resin of the reference is ground into particles which then carbonized under nitrogen. These particles are then thermally treated which results in a granular carbon material in a primary activation treatment followed by pulverization of the granular material. On the other hand, in '277, the phenolic resin employed is blended with surfactant, glycerol, oxyalkylene compound and lipophilic compound, which mixture is then cured followed by molding, carbonization and activation of the carbon product. Thus, it is clear that the resin based formulation of the reference is employed to prepare a molded product, which **no** such molding is employed in the process of the '446 reference. How then would one of skill in the art consider it obvious to modify the procedure of '446 by including components of the resin

formulation of '277 which are used to provide an intermediate molded product when '446 does not prepare a molding as an intermediate stage material? Even if somehow a modified procedure for preparing a carbon product is arrived at by the combination, note that in the '446 reference, the structure of the active carbon material is such that the preferred specific surface area disclosed ranges from 600 to 1500 m²/g. Moreover, there is no disclosure of the ratios of the volumes of micropores, mesopores and macropores, based on the total volume of the pores and the pore volumes of the types of pores in the reference. Further, the pore size distribution of the active carbon material obtained must be different from the claimed carbonaceous material of the invention, because the method of production disclosed in the reference is different from the method of production of the present invention. On the other hand, as pointed out above as to the '277 reference, the pore size distribution in the carbonaceous product of the reference is totally different from that set forth in the present claims (Claim 17). How then does a combination of the two references arrive at the present invention?

It also should be noted that in '277, a formed sheet is cured and carbonized which is used as an electrode "as is". In contrast, in accordance with the present invention, an activated carbon is used which is formed together with a binder to prepare a sheet electrode.

As the product claimed in present claim 17, neither of the two references show or suggest the specific total pore volume and specific surface area limitations of the present claims as well as the micropore, mesopore and macropore diameter ranges of the present carbonaceous material. Thus, the combined references do not suggest the present product and withdrawal of the rejection is respectfully requested.

Claims 17-24, 31 and 38-43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 06-216,446 in view of JP 4-175,277 and further in view of JP 5-243,092 and JP 2-297,915. This ground of rejection is respectfully traversed.

Applicants retain their position as stated above with respect to '446 and '277. However, the latter two cited references clearly fail to correct the deficiencies of the '446 and '277 references. Specifically, neither of the latter two cited references describe or suggests the use of the particular liquid thermosetting resin in the present invention in the formation of a porous carbonaceous material used in an electric double layer capacitor. '092 discloses an electrolytic capacitor, not an electric double layer capacitor. In the electrolytic capacitor of '092 salicylic acid is used as an electrolyte solution and the electrodes of the electrolytic capacitor consist of aluminum foil alone with no activated carbon. Thus, the reference is totally irrelevant to the present invention as well as the two primary references.

As to '915, although indeed the reference discloses electric double layer capacitors, the active carbon material is obtained by foaming and curing a phenol resin, followed by carbonizing and activating the foamed product. A foaming agent is added to the phenol resin for curing. However, it is not clear whether the phenol resin is liquid or solid, and no viscosity information is provided. As described above, these material parameters of the resin starting material employed in the present process embodiments are critical in obtaining the claimed carbonaceous material of the present invention. Further, there is no suggestion of the pore size distribution of the activated carbon product obtained. Clearly, the combined references do not obviate any of the claimed aspects of the present invention and withdrawal of the rejection is respectfully requested.

Claims 17-24, 29-31, 38, 42 and 43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 06-216,446 in view of JP 4-175,277. This ground of rejection is

respectfully traversed for the same reasons as stated above. Neither of the two references teach or suggest the process embodiments of the invention, and the combination of the two references, with a view to suggesting the present process embodiments, do not teach the process parameters defined in the present claims which are critical to obtaining the product of the present invention. Moreover, it is absolutely clear that neither reference teaches or suggests a carbonaceous product having the specific property requirements for the carbonaceous product of the invention. Accordingly, withdrawal of the rejection is respectfully requested.

Claims 17-24, 31-33 and 38-43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 06-216,446 in view of JP 4-175,277 and further in view of JP 5-243,092 and JP 2-297,915 as applied to Claims 17-31 and 34-43 and further in view of Hiratsuka et al U.S. Patent 5,754,393. This ground of rejection is respectfully traversed.

Applicants retain their positions as set forth above concerning the cited and applied JP references. None of these references teaches or suggests a carbonaceous material which is characterized by the specific surface area, total pore volume and micropore/mesopore/macropore requirements of present Claim 17. Moreover, none of the JP references, whether considered alone or in combination, teach or suggest the precise combination of steps of the present invention which lead to a carbonaceous product having the structural features of the presently claimed product.

The deficiencies of the JP references are neither overcome nor improved by Hiratsuka et al. The patent is cited because it shows electrolyte solution factors. However, these factors are of secondary interest in the claiming of the product and process features of the present invention, and therefore are not features upon which applicants rely for patentability. Withdrawal of the rejection is respectfully requested.

Claims 44-49 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 06-216,446 in view of JP 4-175,277 and further in view of JP 5-243,092 and JP 2-297,915. This ground of rejection is respectfully traversed.

The Examiner contends that the present process as claimed is an obvious variant of the process as claimed in '446 for preparing a carbonaceous product suitable for use as an electrode material. However, as is apparent from the discussion above concerning the '446 reference, the process of '446 is fundamentally different from that of the present invention, because it requires primary activation of resin particles **subsequent** to carbonization of the particles, followed by grinding (pulverization) of the particles to powder. On the other hand, in the present process embodiments the resin employed in the process is cured and the cured material obtained is then pulverized, followed by carbonization. Thus, pulverization in the present process occurs before carbonization which means that in the carbonized product the formation of mesopores tends to be uniform. Accordingly, the process of the present invention is fundamentally distinct from that of '446 resulting in a materially different carbonaceous product. The remaining references do not contain teaching which would overcome the deficiencies of '446. Accordingly, withdrawal of the rejection is respectfully requested.

It is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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MARKED-UP COPY OF AMENDMENT UNDER 37 C.F.R. §1.116

IN THE SPECIFICATION

Page 46, line 20 to page 47, line 6, delete the paragraph in the entirety, and insert therefor:

--(1) To the phenolic resin A of Example 1, 0.5 mass % of hexamethylenetetramine as a curing agent was added to obtain a liquid resin R having a viscosity of 4.5 Pa·s at 25°C. A carbonaceous material R was obtained from the resin R under the same condition as in Example 1. The mass reduction till 400°C in the carbonization was 27 mass %. Of the activated carbon, the specific surface area was 1,050 m²/g, the total pore volume was 0.75 cm³/g, the ratio of the volume of pores having diameters of from 10 to 20 Å was 18 % based on the total pore volume, the ratio of the volume of pores having diameters of from 20 to 200 Å was 61 % based on the total pore volume, and the ratio of the volume of pores having diameters exceeding 200 Å was 3% [21 %] based on the total pore volume.--

Page 49, please amend Table 1 (continued) to read:

Table 1 (continued)

	Ratio of pore volume based on the total pore volume			Total pore volume (cm ³ /g)	Specific surface area (m ² /g)	Capacitance (F)	Internal resistance (Ω)
	10-20 Å	20-200 Å	Over 200Å				
Comparative Example 1	24	10	1	0.73	1500	2.65	12.2
Comparative Example 2	20	8	2	0.41	900	1.13	10.2
Comparative Example 3	20	4	1	0.70	1600	2.80	13.5
Comparative Example 4	25	5	1	0.89	2050	2.85	11.5
Comparative Example 5	15	2	0.5	0.64	1300	1.95	15.5
Comparative Example 6	9	65	22	2.55	1200	1.54	27.5
Comparative Example 7	21	8	2	0.85	1800	2.26	9.5
Comparative Example 8	8	65	17	2.51	1750	1.39	24.3
Comparative Example 9	18	60	20	1.61	1500	2.1	19.5
Comparative Example 10	18	61	21	0.75	1050	1.32	22.5